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(58) Field of search
B8C

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(54) Semiconductor part-carrying tape

(57) A semiconductor part-carrying tape comprises identification marks (4) formed at points on the tape (1) to distinguish groups of semiconductor parts carried on the tape from adjacent groups. The identification marks may comprise holes (4) located marginally or centrally of the tape, edge notches and coloured or non-reflecting regions.

FIG. 1A

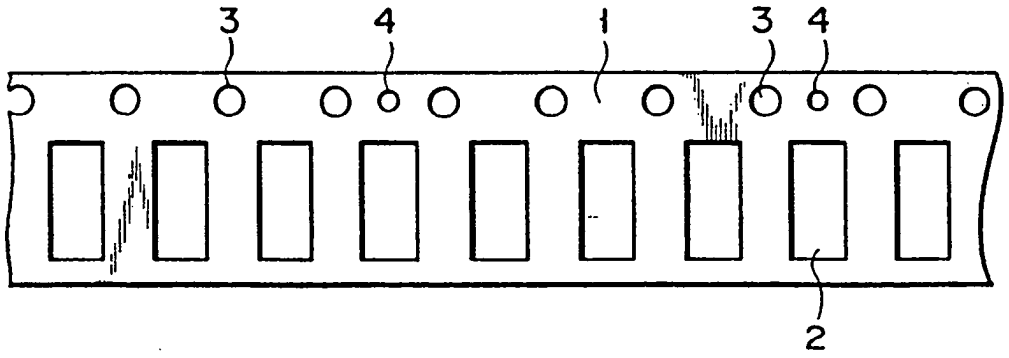

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FIG. 1A

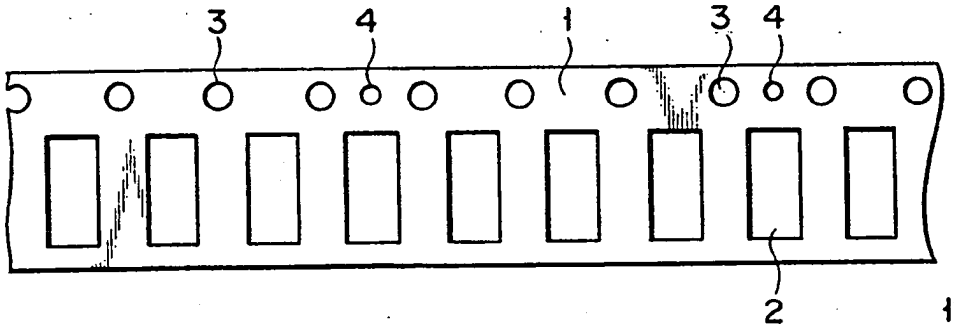


FIG. 1B

FIG. 2A

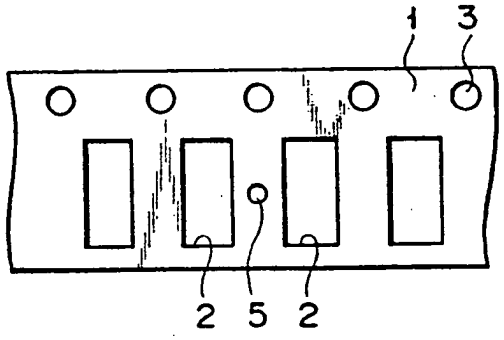


FIG. 2B

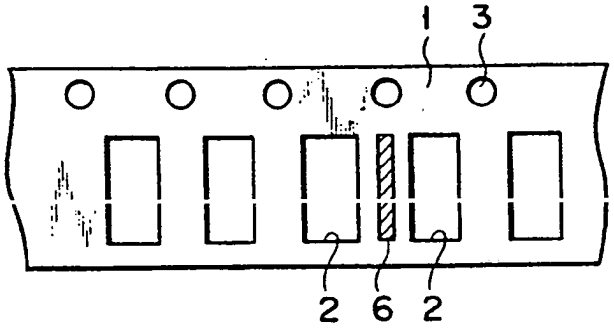


FIG. 2C

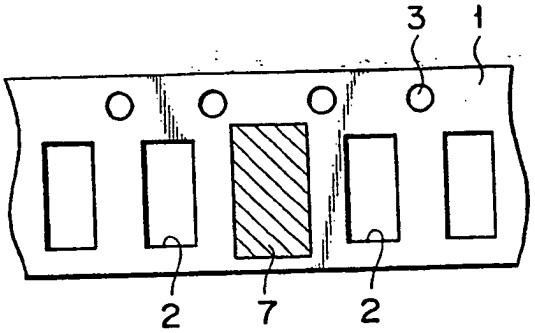


FIG. 3

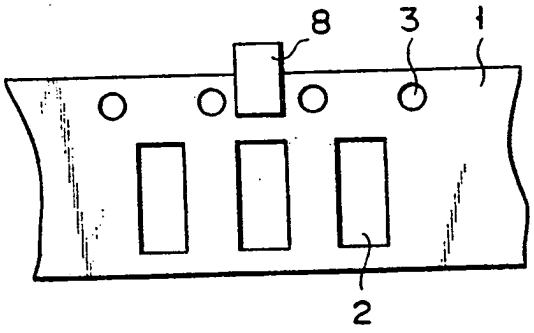


FIG. 4

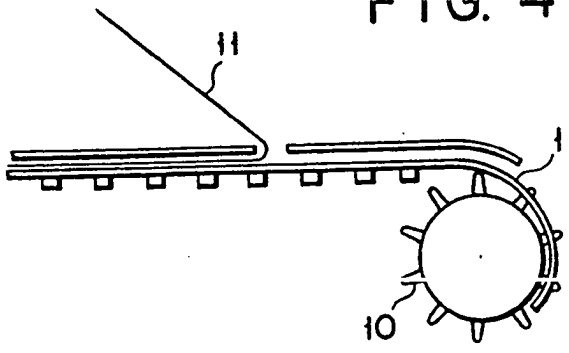


FIG. 5

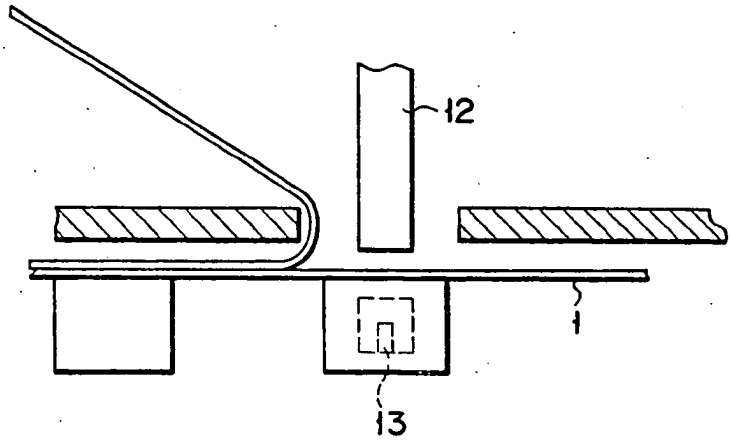


FIG. 6A

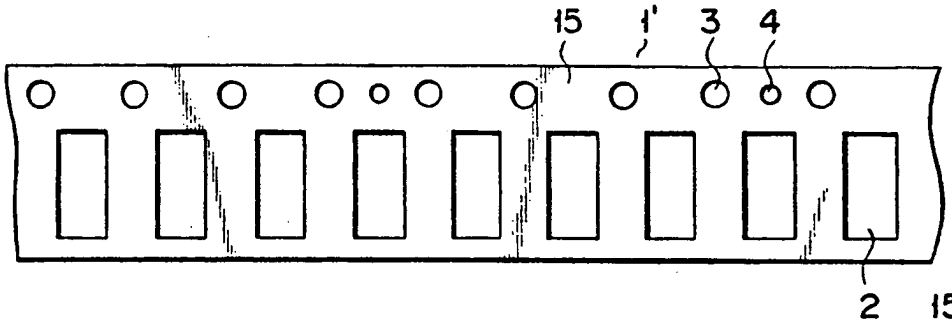


FIG. 6B

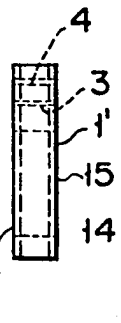


FIG. 7A

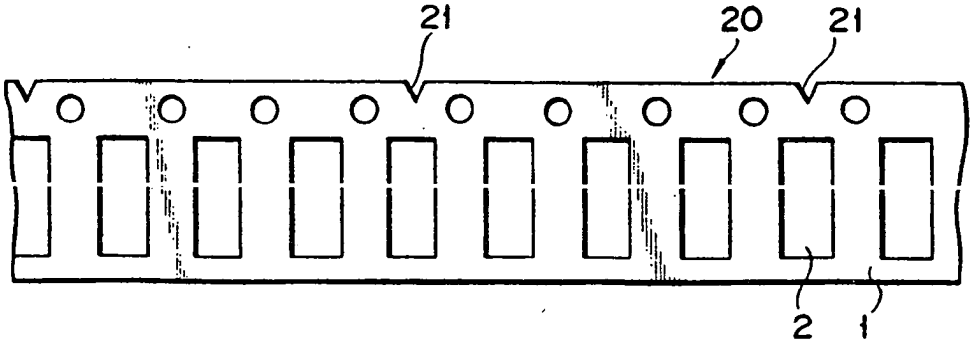


FIG. 7B

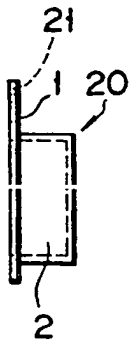


FIG. 8

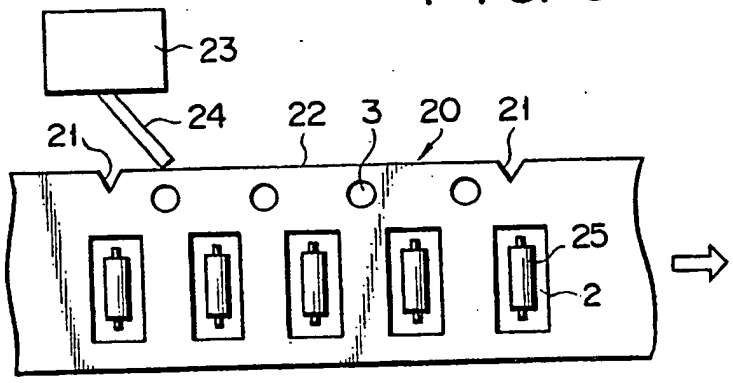


FIG. 9A

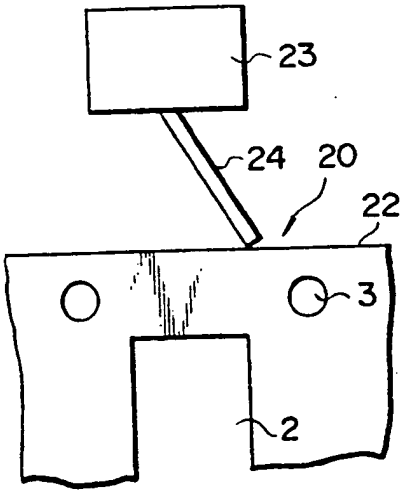


FIG. 9B

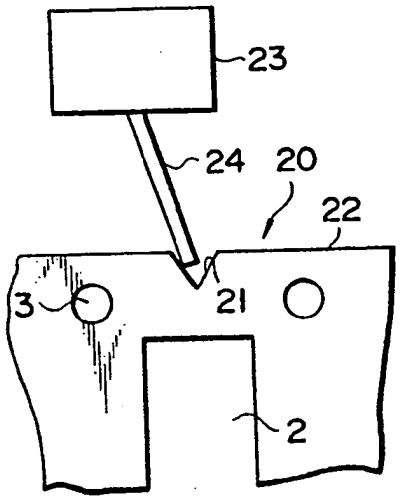


FIG. 10

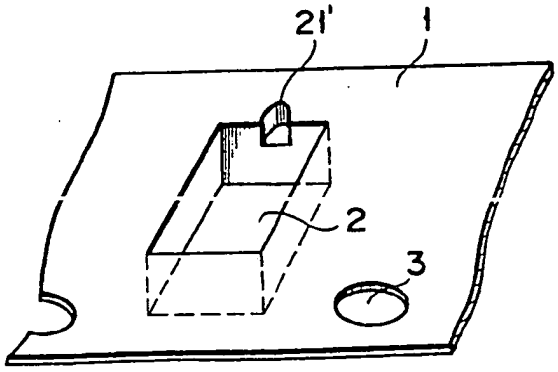


FIG. 11A

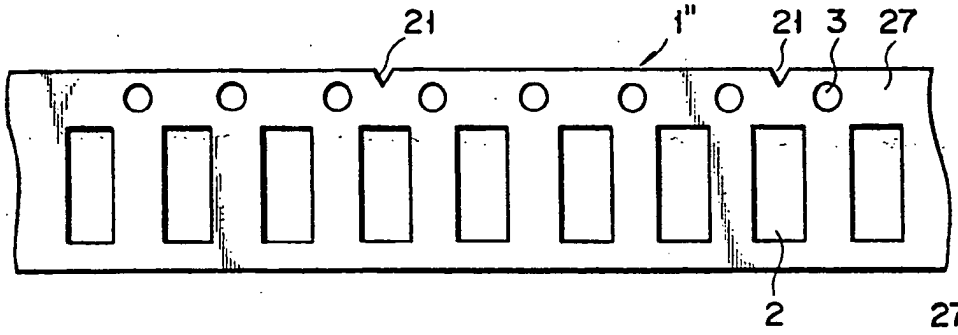


FIG. 11B

FIG. 12

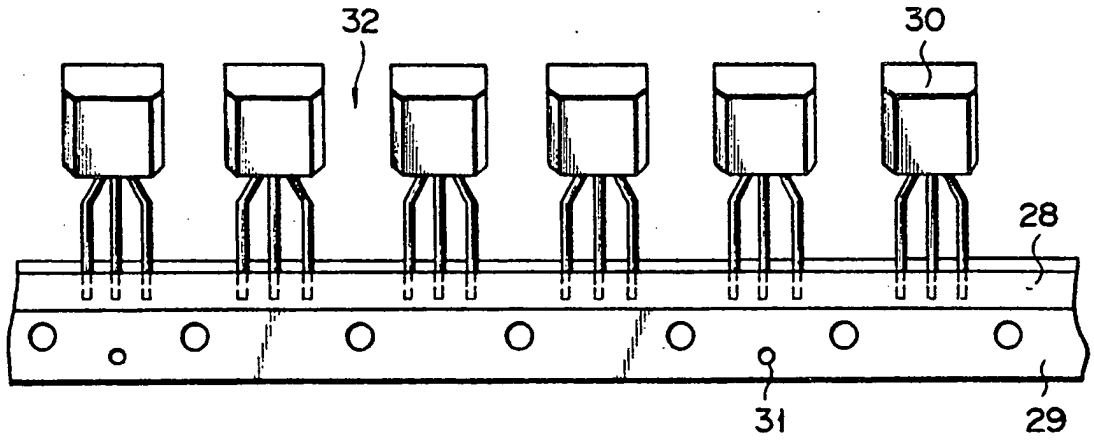
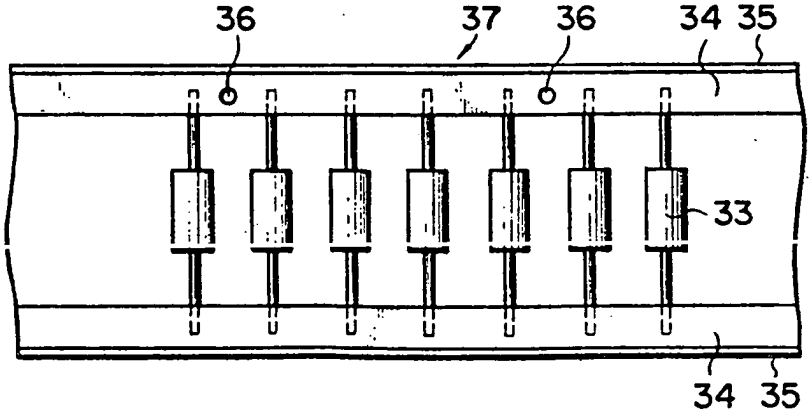


FIG. 13



SPECIFICATION

Semiconductor part-carrying tape

This invention relates to a semiconductor part-carrying tape and, more particularly, to a tape for carrying semiconductor parts whose type can not be easily identified by simple observation with the naked eye.

When semiconductor parts are packed, the conventional practice is to group semiconductor parts having the same electrical properties apart from those having different electrical properties. The electrical proporties of, for example, a transistor, D.C. amplifying degree (h_{FE}), and yield point voltage are checked. The electrical properties of, for example, a diode, the capacity-voltage, breakdown voltage, and switching properties are examined. However, recent trends are moving toward a finer classification of the electrical properties of semiconductor parts.

At present, semiconductor parts having different properties are supplied to the prescribed spots on a substrate in a prescribed number by an automated device. In this case, semiconductor parts having the same electrical proporties are grouped together and fixed to a carrying tape, which is later transported to a specified site. With the conventional semiconductor part-carrying tape, a blank space having an area corresponding to the total area occupied by several semiconductor parts is provided in the tape as a means for distinguishing between semiconductor parts having different electrical properties. In other words, semiconductor parts having different electrical properties than the preceding semiconductor parts are attached to that portion of the tape which immediately follows said blank space.

With the conventional semiconductor part-carrying tape, a broader blank space has to be allowed in case a plurality of groups, each consisting of a smaller number of semiconductor parts, has to be attached to the conveying tape. The drawback is that one roll of tape can carry a smaller number of semiconductor parts. Further disadvantages of the conventional semiconductor part-conveying tape are that when a tape is applied with a large amount of blank space allowed, the tape has to be frequently exchanged for a frash one, leading to a decline in the taping operation; moreover, the soft wear of an automatic input device, related to the application of the semiconductor part-carrying tape, has to be revised to defective blank spaces formed in said tape.

It is accordingly the object of this invention to provide a semiconductor part-carrying tape which can smoothly carry semiconductor parts having the same prescribed electrical properti s to a semiconductor substrate in exactly the prescribed number without providing a

To attain the above-mentioned object, this invention provides a semiconductor part-carrying type wherein a large number of semiconductor part-fixing spots are spatially formed lengthwise of the tape, and an identification mark is indicated in a space defined between the adjacent semiconductor part-fixing spots.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1A is a plan view of a semiconductor part-carrying tape according to a first embodiment of this invention;

Fig. 1B is a front view of a semiconductor part-carrying tape according to the first embodiment of the invention;

Fig. 2A is a plan view of a semiconductor-carrying tape which has an identification mark indicated between the rearmost unit of one group of semiconductor parts of an equal electrical property and the foremost unit of another group of semiconductor parts collectively having a different electrical property than those of the adjacent group;

Fig. 2B is a plan view of a semiconductor part-carrying tape which has a colored identification mark indicated between the rearmost unit of one group of semiconductor parts of an equal electrical property and the foremost unit of another group of semiconductor parts collectively having a different electrical property than those of the adjacent group;

Fig. 2C is a plan view of a semiconductor part-carrying tape which has a nonreflecting identification mark indicated between the r armost unit of one group of semiconductor parts of an equal electrical property and the foremost unit of another group of semiconductor parts collectively having a different electrical property than those of the adjacent group;

Fig. 3 sets forth a semiconductor part-carrying tape which has a photosensor-type identification mark indicated between the r armost unit of the preceding group of semiconductor parts and the foremost unit of the succeeding group of semiconductor parts;

Fig. 4 illustrates the process of taking off semiconductor parts one after another from a semiconductor part-carrying tape according to the first embodiment of the invention;

Fig. 5 is an enlarged view of the main section of Fig. 4;

Fig. 6A is a plan view of a semiconductor part-carrying tape whose surface is wrapped with a cover tape;

Fig. 6B is a front view of said covered semiconductor part-carrying tape;

Fig. 7A is a plan view of a semiconductor part-carrying tape according to a second embodiment of this invention, which has a notch type identification mark provided along one side of said tape between the respectiv groups of semiconductor parts;

Fig. 8 illustrates the manner in which the surface condition of the semiconductor part-carrying tape according to the second embodiment of the invention is checked by a microswitch;

Fig. 9A indicates the actuator of said microswitch pressed against the edge of the semiconductor part-carrying tape embodying this invention;

Fig. 9B illustrates said microswitch actuator pressed against the notch type identification mark of Fig. 7A;

Fig. 10 shows an identification mark formed on the wall of a semiconductor part-carrying depression;

Fig. 11A is a plan view of a semiconductor part-carrying tape according to the second embodiment of the invention, whose surface is wrapped with a cover tape;

Fig. 11B is a front view of said wrapped semiconductor part-carrying tape;

Fig. 12 is a plan view of a semiconductor part-carrying tape according to a third embodiment of the invention, wherein the semiconductor part-fixing depression of the first and second embodiments is replaced by a composite body constructed by superposing a semiconductor part-fixing tape on the base tape; and

Fig. 13 is a plan view of a semiconductor part-carrying tape, both sides of which are provided with the composite body of Fig. 12.

Fig. 1A is a plan view of a semiconductor part-carrying tape (hereafter simply referred to as the tape) according to a first embodiment of this invention. Fig. 1B is a front view of said tape. A plurality of semiconductor part-fixing depressions 2 are provided lengthwise of said tape body 1 at a prescribed interval. A semiconductor part-transporting hole 3 is provided between two adjacent depressions 2. The semiconductor part-fixing depressions 2 are grouped in fours and arranged along one side of said tape body 1. An identification mark hole 4 is formed at that point on one side edge of the tape body 1 which faces the fourth, namely, last depression of each group. The reason why said identification mark hole 4 is formed along side the fourth depression of each group in that semiconductor parts having the same electrical properties constituting one group are carried by the tape body 1 in a minimum number of four. It is therefore preferred that the identification mark hole be provided between two groups with each consisting of a minimum number of semiconductor parts having identical electrical properties. The identification mark hole 4 may be formed at the same time as the transport holes 3 are provided in the tape body 1, or after the semiconductor part is securely seal d in the depression 2. Or as shown in Fig. 2A, an identification mark hole 5 may be formed between the prescribed two-adjacent-semiconductor part-fixing depressions 2, 2. Further as shown in Fig. 2B, a colored region 6 may be provided between said two adjacent depressions 2, 2. Further as seen from Fig. 2C, one of the two adjacent depressions 2, 2 is used as a nonreflecting region 7, thereby causing said depression 2, 7 to jointly act as an identification mark 2 to 7.

With the above-mentioned semiconductor part-carrying tape constructed as described above, an identification mark 4 is provided in the proximity of the last unit of each group of depressions for fixing a minimum number of semiconductor parts having identical electrical properties, thereby enabling one group of semiconductor parts having equal electrical properties to be easily distinguished from those collectively having different electrical properties than those of the adjacent group. The identification mark 4 shown in Fig. 1A can be easily detected by an output signal from a photosensor 8 provided in that portion of one side edge of the tape body 1 which faces said identification mark 4.

The removal of a semiconductor part from the tape body 1 is carried out by the following steps. First, the pawl 10 of a sprocket 9, provided in the semiconductor part-assembling device, is made to be engaged with the transport hole 3 as shown in Fig. 4. In this state, the tape body 1 is allowed to travel. Thereafter, while the cover tape 11 is peeled from the tape body 1, a vacuum chuck 12 is brought down from above the depression 2. The semiconductor part 13 is taken out of the depression 2 by the sucking action of said vacuum chuck 12.

Since the tape body 1 embodying this invention enables a plurality of groups, each consisting of semiconductor parts having different electrical properties, to be continuously held in the fixing depressions 2, it is possible to supply a large number of electrical parts to, for example, a substrate. Further, since blank regions of the tape body 1, constituted by the semiconductor part-fixing depressions, occupy a small area, the semiconductor parts can be smoothly carried to, for example, a substrate. Further, it is unnecessary to set blank region-detecting soft ware in an automatic tape-inserting device. As seen from Figs. 6A, 6B, it is possible to wrap the closed portions of both sides of a semiconductor part-holding frame 14 mounted on the tape body 1′ with cov r tapes 15. 15.

Figs. 7A and 7B show a semiconductor part-carrying tape according to a second embodiment of this invention. This second embodiment differs from the first embodiment in that an identification mark notch is set at that point on one side edge of the tape body 1 which faces a prescribed semiconductor part-fixing depression 2. With the tape body 1 constructed as described above, the identification mark notch 21 is defected, as shown in

microswitch 23 against the edge of the tape body 1. While the acuator 24 remains pressed against the edge 22 of the tape body 1, as shown in Fig. 9A, no signal is issued from the microswitch 23. When the actuator 24 is pressed against the identification mark notch 21, as seen from Fig. 9B, a prescribed output signal is sent forth from the microswitch 23, thereby giving information on the number of semiconductor parts 25 supplied to the substrate.

An identification mark notch 21' may be formed, as shown in Fig. 10, in the wall of the semiconductor part-carrying depression 2. It is also possible to wrap the open portions of both sides of a semiconductor part-holding frame 26, mounted on the tape body 1," with cover tapes 27, as seen from Figs. 11A and 11B.

It is further possible to construct a semiconductor part-carrying tape 32 by superposing a fixing tape 28 on the tape body 29 instead of providing the aforementioned semiconductor part-holding depression, and perforating an identification mark hole 31 at that point of the tape body 29 which distinguishes a group consisting of a minimum number of semiconductor parts 30 from an adjacent similar group.

Further, as shown in Fig. 13, it is possible to construct a semiconductor part-carrying tape 37 by securely fixing the respective semiconductor parts 33 at both ends by a tape body 35, to the sides of which a fixing tape 34 is superposed, and perforating an identification mark hole 36 at that point on the tape body 35 which distinguishes a group consisting of a minimum number of (for example, four) semiconductor parts from an adjacent similar group.

As mentioned above, the semiconductor part-carrying tape embodying this invention offers the advantages that an increased number of semiconductor parts can be smoothly fixed to a substrate, and a group of semiconductor parts having equal electrical properties can be easily distinguished from an adjacent group of semiconductor parts collectively having different electrical properties than those of the aforesaid group.

CLAIMS

1. A semiconductor part-carrying tape which comprises:

a tape body;

a plurality of semiconductor part-fixing sections arranged lengthwise of said tape body at a prescribed interval; and

an identification mark provided at that point on said tape body which distinguishes a group consisting of a prescribed number of semiconductor parts from an adjacent, similar group.

2. The semiconductor part-carrying tape according to claim 1, wherein said identification mark is formed at that prescribed point on the tape body which distinguishes a group of said semiconductor part-fixing section from an adjacent, similar group.

3. The semiconductor part-carrying tape according to claim 2, wherein said semiconductor part-fixing sections are formed in the tape body in an integral multiple of a minimum number of the semiconductor parts held by said fixing sections.

4. The semiconductor part-carrying tape according to any of claims 1 to 3, wherein said semiconductor part-fixing section is mad in the concave form.

5. The semiconductor part-carrying tape according to any of claims 1 to 3, wherein said semiconductor part-fixing section is constituted by a semiconductor part-fixing tape superposed on said tape body, and a semiconductor part is interposed between said fixing tape and tape body.

6. The semiconductor part-carrying tape according to any of claims 1 to 5, wherein said identification mark is represented by a hole formed at a prescribed point on the tape body.

7. The semiconductor part-carrying tape according to any of claims 1 to 5, wherein said identification mark is represented by a notch formed at a prescribed point on one side edge of the tape body.

8. The semiconductor part-carrying tape according to any of claims 1 to 5, wherein said identification mark is constituted by a colored spot provided in the prescribed section of the tape body.

9. A semiconductor part-carrying tape, substantially as herein described with reference to the accompanying drawings.

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